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10 Device for checking the authenticity of banknotes

The invention relates to a device for checking the authenticity of moving banknotes, vouchers or the like.

15 There are known procedures for checking banknotes for authenticity when they are stationary, by measuring the penetration of light and the reflection of light at specific measuring points. A disadvantage of this is that the quality of the measurement depends on the number of measuring points.

20 There are also known procedures for magnetically scanning banknotes, e.g. US dollar bills, provided with electrically conductive printing as they pass through a magnetic field. Notes which do not have the electrically conductive printing cannot be checked using this method.

Patent number (patent application teaches a method for checking the authenticity of
25 banknotes, wherein the authenticity of the note is checked optically during the passage of the banknote through a light source with an opposing photocell. The light intensity on the side of the banknote facing away from the light source, which changes during the passage, is used to check authenticity.

30 The object of the invention is to create a device for checking the authenticity of moving banknotes, which can be used in an easy and operationally reliable manner and also even checks

the authenticity of banknotes of different value and/or different currency.

This object is achieved in accordance with the invention by a conveyor device with a guide track for the banknote and a stationary checking device which irradiates the banknote and conveyor
5 device. After checking is complete, the checking device triggers a signal which makes a decision between accepting or returning the banknote. The device in accordance with the invention can be used in a variety of operationally reliable ways, e.g. in automated travel ticket machines, token-operated automated machines and automated admission ticket machines.

10 An advantageous embodiment of the invention is characterised in that the conveyor device is a transparent drum. When the banknote is being checked for authenticity the drum is irradiated. It must be of high optical quality in order that it does not falsify the result of the check, e.g. if it is cloudy or smeared. Glass and acrylic glass are suitable. Acrylic glass may be preferable if low weight is a consideration.

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In the case of a further advantageous embodiment of the invention the drum is not permeable to being irradiated and has apertures in the checking region. The apertures are expediently located where the optical scanning takes place. The apertures cannot become dirty and offer absolutely no resistance to the passage of light. The drums can also consist of non-transparent material.

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In a still further advantageous embodiment of the invention a belt is pressed against the contour of the drum. The banknote is clamped in between the drum and belt. The belt preferably consists of a transparent elastic material and runs concurrently without being driven.

25 It is also advantageous in accordance with the invention that the edges of the drum serve as a guide track for the banknote and, while forming a gap between the banknote and the drum, protrude in a collar-like manner beyond the diameter of the drum. The banknotes are not in any touching contact with the drum and cannot dirty or scratch it or make it cloudy.

30 In a still further advantageous embodiment of the invention, one side of the drum has a shoulder against which the banknote lies and the other side of the drum is a cylindrical surface which

protrudes beyond the contour of the drum, and pressing belts are disposed on both sides of the drum. This embodiment of the invention makes it possible to check banknotes of different dimensions, currency or different value. It is particularly suitable for automated machines in railway stations, e.g. for receiving 10, 20, 50 and 100 Deutschmark banknotes, for automated money changing machines at airports, on ships, at border crossings, e.g. for changing dollar bills into Deutschmark notes.

A further advantageous feature in accordance with the invention is that a rocker arm is provided, the front edge of which passes into the gap between the banknote and the drum and can lift the banknote from the guide track. The rocker arm reliably lifts the banknote from the conveyor device if it is to be accepted; one of its guide surfaces serves as a contact for the banknote supplied to a discharge device if the banknote is to be returned.

In a still further advantageous embodiment of the invention the insertion slot can be locked. The input slot is closed e.g. when there is a fault with the device or an automated machine appertaining thereto, such as if the electrical voltage source has failed, and/or during checking of a banknote until it has been decided whether it will be accepted or returned.

Further features, advantages and possible applications of the present invention are given by the following description and by the enclosed illustrations of exemplified embodiments in which:

Fig. 1 shows a vertical cross-sectional view through a device in accordance with the invention,

Fig. 2 shows a drum with belts for banknotes of different width,

Fig. 3 shows a plan view of an input slot for banknotes, which changes in width, and

Fig. 4 shows a partial side view of the drum of Figure 2,

Fig. 5 shows a divided rocker arm 24, the position of which determines the path of the

banknote after checking.

5 A banknote checking device 1 has an input device 2 with an insertion plate 3 and an insertion slot 4. Behind a wall 5 the insertion plate 3 is pierced. A light barrier 6 which is provided with a light source 7 and a photocell 8 is located at the pierced point of the insertion plate 3. If the front edge of a banknote 9 pushed through the insertion slot breaks the beam path a drive motor is switched on which drives the drive wheel 10 and, e.g. by means of a toothed belt 11, the drive wheel 14 fixedly connected on the drum axle 12 to the drum 13. By means of the rollers 15, 16, 17, 18 the endless belt 19 (or a plurality of belts) hugs the contour of the transparent drum 13.

10 The banknote 9 is clamped in between the belt 19 and the drum 13 and, during movement of the drum, is guided past a checking device 20. The checking device 20 has an irradiating source 21, fixedly disposed within the drum, and one or a plurality of checking photocells 22. The checking device can be displaceable perpendicular to the illustrated plane of observation. The divided rocker arm 24 can be actuated by the checking device 20 via a pull-type magnet 23, the

15 rocker arm being able to adopt two discrete positions. In the normal position indicated in broken lines the rejected banknote 9 runs along the upper edge 25 of the rocker arm to a discharge slot 26. If the checking device determines that the banknote is "genuine" the rocker arm is pivoted about the point of rotation 27 to the position illustrated by a solid line and is guided on the path 28 to an acceptance container by means of one or a plurality of rollers 40

20 which press against the roller 18. A light barrier is located on this path and, when an edge of the banknote breaks the beam path, transmits an acceptance command signal, e.g. to a travel ticket printer, not shown. At the same time the drive motor for the drum 13 is switched off.

A light barrier 30 is located in the output slot 26 and switches off the drive motor when a

25 banknote passes through. Special rollers can be provided as additional drive means for the banknote in the output slot 26 or on the path 28 but this is not shown.

Figure 5 shows a plan view of a divided rocker arm 24a, 24b. A roller 41 is disposed between the rocker arm parts and is attached to the rotational axle 42 of the rollers 18. If necessary, a

30 further belt 14 can run thereon. The rollers 40 cooperate with the rollers 18 and 41 and guide the banknote into the path 28. The directions of rotation are respectively indicated by arrows.

The divided rocker arm serves to safely guide the checked banknote for acceptance. A metal plate can be attached to the rocker arm parts 24a, 24b and forms a tangent to the roller 41 when the banknote is not "genuine" and is supplied to the output slot.

- 5 As shown in the cross-sectional view of Figure 2, the drum 13 consists of transparent material or organic glass. Bushings 31, 32 are pressed into the side of the drum and comprise guide tracks 33, 34. At least one bushing 31 has a shoulder 35 which serves to guide the banknote laterally. The bushings consist e.g. of light metal. As also shown by Figure 2, a single drum can convey and check banknotes of different width, the width of which is at least B_1 and not greater than B_2 .
- 10 A gap 36 remains between the banknote and the drum, a point 37 of the rocker arm 24 passes into this gap in order to lift the banknote 9 as shown schematically in Figure 4. Dirty banknotes do not impair the transparency of the drum since there is no touching contact between the banknote and the drum.
- 15 Fig. 3 also schematically shows an insertion slot 4 for banknotes, the width of the slot can be changed. A magnet 38, shown in Figure 1, displaces the stop 39 in the direction of the arrow. When the user wants to introduce e.g. a banknote for 10 Deutschmarks into the device 1 he presses a "DM 10" key which is provided on the front of the automated machine. The stop 39 is displaced to the corresponding position; the checking device 20 adjusts to a 10 Deutschmark
- 20 banknote. Illumination of the recently pressed key shows the user that the automated machine is ready to check a 10 Deutschmark banknote. As soon as the 10 Deutschmark banknote has entered the insertion slot 4 and is supplied to the checking device 20 on the drum the insertion slot is expediently locked. Only when the banknote is checked and has either been accepted or returned is the insertion slot reopened.
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- If there is a fault in the automated machine or e.g. if there is a power outage, the insertion slot 4 is locked. If there is a fault on the automated machine or in the power supply during the checking of the banknote 9, the insertion slot is closed and the rocker arm 24 is pivoted to the position illustrated by broken lines, so that it is no longer possible to accept banknotes. An
- 30 auxiliary circuit supplied by a battery supplies the drive motor with power for a certain time, e.g. 20 seconds, via a time lag relay so that the banknote located in the banknote checking

device is returned.

Claims

- 1 Device for checking the authenticity of moving banknotes, characterised by a conveyor
5 device with a guide track (13) for the banknote (9) and a stationary checking device (20)
 which irradiates the banknote (9) and conveyor device (13).
- 2 Device as claimed in claim 1, characterised in that the conveyor device is a transparent
 drum (13).
- 10 3 Device as claimed in claim 2, characterised in that the drum (13) is not permeable to being
 irradiated and has apertures in the checking region.
- 4 Device as claimed in claims 2 to 3, characterised in that a belt (19) is pressed against the
 contour of the drum (13).
- 15 5 Device as claimed in claims 2 to 4, characterised in that the edges of the drum (13) serve
 as a guide track (33, 34) for the banknote and, while forming a gap between the banknote
 and the drum, protrude in a collar-like manner beyond the diameter of the drum.
- 20 6 Device as claimed in claims 2 to 5, characterised in that, in order to check banknotes of
 different value, one side of the drum (13) has a shoulder (35) against which the banknote
 (9) lies and the other side of the drum is a cylindrical surface which protrudes beyond the
 contour of the drum, and pressing belts (19) are disposed on both sides of the drum.
- 25 7 Device as claimed in claims 5 to 6, characterised by a rocker arm (24), the front edge of
 which passes into the gap between the banknote and the drum and can lift the banknote (9)
 from the guide track (33, 34).

Reference list

	1	banknote checking device
	2	input device
5	3	insertion plate
	4	insertion slot
	5	wall
	6	light barrier
	7	light source
10	8	photocell
	9	banknote
	10	drive wheel
	11	toothed belt
	12	drum axle
15	13	drum
	14	drive wheel
	15-18	rollers
	19	belt
	20	checking device
20	21	irradiating source
	22	checking photocell
	23	pull-type magnet
	24(a-b)	rocker arm
	25	upper edge
25	26	discharge slot
	27	point of rotation
	28	path
	29	light barrier
	30	light barrier
30	31, 32	bushings
	33, 34	guide track

	35	shoulder
	36	gap
	37	point
	38	magnet
5	39	stop
	40	roller
	41	roller